

## ORIGINAL AND SELECTED PAPERS.

### ON FLUID EXTRACTS AND THEIR MENSTRUUA.\*

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To the American Pharmaceutical Association.

In continuation of the subject of Percolation and Economy of Alcohol, annually presented to the Association for some year's past, the writer offers an abstract of the results of his last year's experience, premising that he has neither the time nor inclination—as time becomes more valuable—to defend his notions, judgment, or accuracy, or even to point out many of the deductions that might be drawn from the statements made as facts.

It is not uncommon to hear observant physicians say that they do not obtain results from the fluid extracts corresponding in the proportion of minim for grain to the drug which they represent; and pharmacists who use the official formulas must be aware that the drugs are not entirely exhausted by the processes given. A critical inquiry into this subject, in this direction, is the chief object of this paper.

A practical way to measure the rate and extent of exhaustion by percolation has long been needed, and the want of some simple and easy plan has, perhaps more than any other obstacle, stood in the way of accurate knowledge and progress in the art of percolation. After many trials, some of which were described in previous papers, the method by specific gravity has thus far proved the most satisfactory and successful. But when applied by the hydrometer, or by the ordinary specific gravity bottle, with the necessary calculations, it is too abstruse and complicated for common usage.

It is to a more plain and simple application of the principle of specific gravity that attention is now to be directed, and the formula may be stated as follows:—In percolation the density of the percolate will vary from the density of the menstruum in proportion to the extent and rate of the exhaustion. It follows from this proposition that to measure the extent and rate of exhaustion, it is only necessary to measure the extent and rate at which the percolate varies from the menstruum at the beginning of a percolation and approaches to it at the end, absolute exhaustion being indicated by equal density—or equal weight of the same volume at the same temperature—of the menstruum and percolate. This measuring is usefully accomplished with sufficient accuracy by separating the percolate as it passes into successive portions of a pint each and weighing them. By subtracting from this the weight of a pint of the menstruum at the same temperature, a series of differences will be obtained expressing the extent and rate of exhaustion. When the

exhaustion is practically completed,—it is never absolutely accomplished,—the residue is dried and weighed, and its weight subtracted from the weight of the substance as originally taken for percolation. The difference or loss in weight indicates the total amount of solid matter dissolved and removed by the menstruum. Then, as the sum of the differences in weight between equal volumes of the menstruum and percolate at the same temperature, is to the total amount of solid matter or extract dissolved out by the menstruum, so is each separate difference to the weight of solid extract in the portion of percolate which that difference represents. That is to say, the total weight or amount of solid extract being ascertained, the ratio of the differences in density is applied to it to obtain a ratio of the rate of exhaustion, and to ascertain the distribution of the total extract throughout the percolate.

This method, applied to nearly all the fluid extracts which are at present officinal, and to some others, has convinced the writer,

First. That the present officinal processes do not sufficiently exhaust the drugs to which they are applied; and,

Second. That these processes do not take the best way to attain the object. That the supposed advantage of using coarse powders is a delusion. That maceration is useless at the commencement of the process of percolation, but useful after the substance has been partially exhausted. That the menstrua are not always the best that could be selected, either for extracting the useful portions of the drug or for excluding the useless portions. That glycerin is preferable to sugar, where either gives any positive advantage, but that anything like a general use of glycerin in fluid extracts is to be deprecated, as the advantages are more in appearance than reality.

The foregoing table, embracing the substances of nine officinal fluid extracts, and one other, is limited in extent by the size of the page, but is large enough to illustrate these points. These percolations, excepting ergot and lupulin, were all made with fine powders, moistened with more menstruum than is directed by the Pharmacopœia, and the moistened powder put through a sieve of about twelve meshes to the inch before the packing. The packing and percolating was then done with all the care and skill which the writer's experience could suggest, so that the results are considered to be much better than an average practice would give. Each pint of percolate was weighed in a flask marked in the narrow part of the neck, and the menstruum at the same temperature was weighed in the same flask, and the difference in weight set down in the column under that heading. The same powder, managed in the same way, was percolated at once; and another portion, after macerating four days, with no practical difference in result; whilst a maceration of twenty-four hours after the third or fourth pint of percolate had passed, would always increase the difference somewhat, and would often increase them much. Changes of temperature, also, by changing the solvent power of the menstruum, caused the differences to rise and fall somewhat, coincident with changes of weather. A simple inspection of the proportion of the extract

contained in the first pint of each percolate will probably expose the fallacy that any amount of expert skill and management could ever make that pint represent the whole efficacy of the drug. In percolating the powder of good aconite root by a very slow and careful percolation, the characteristic numbing impression upon the tongue was distinctly though faintly perceptible by the application of a few drops from the thirteenth pint. The bitterness of cinchona was perceptible in the seventeenth pint; but neither the taste nor odor of wild cherry bark were perceptible in the sixteenth pint, though the amount of extract contained was large. Ergot was necessarily percolated in coarse powder (No. 60), and was easily and rapidly exhausted; but the dried residue powdered finer gave a notable proportion of extract, which, for want of time, was not determined. Not so with lupulin, however, which, percolated in its natural condition of coarse powder, left a light residue, from which no ordinary management could extract anything more. The percolation of lupulin was very regular and uniform, and maceration at any stage of the process had no perceptible effect. Effective percolations of dandelion root are very slow, and therefore very perfect; and like those of sarsaparilla, often became slower as they approach completion.

The great difference in the rate of exhaustion in the examples given in the table indicates that no general rule of limit can be adopted, but that each substance must be studied by itself. From results given in a previous paper, the solid extract obtained by percolation from some drugs, and probably from all, is not of uniform medicinal value as found in different parts of the percolate, but becomes weaker toward the end. When this ceases to be of practical value, or, in other words, where the percolation should terminate, was not determined. Among the examples given it will be seen that if the Pharmacopœia used fine powder and slow percolation, it would, in the case of dandelion, obtain 86 per cent. of the total extract; and it is probable that this is somewhat near or beyond the limit of practical utility. If so, it might be directed that fluid extracts as a class of preparations should not contain less than 80 per cent. of the total solid extract which the drugs were capable of yielding to the given menstruum; and the limit of percolation necessary to obtain this is shown by one of the lines of the table. But where this 80 per cent. of the solid extract has been obtained, it is not within the compass of a pint, but is contained in a number of pints, never less than 2½ nor more than 11.

To get these various large quantities within the measure of a pint each without the use of heat, and with the least loss of menstruum, is the next and great requisite, without which they are not fluid extracts:

To accomplish this, there appears to be no choice of means. There is one way, and only one way, known to the writer by which it may be done, and that is by repercolation, or percolating fresh portions of the drug with percolate from previous portions, until the normal difference in weight between equal volumes of the menstruum and percolate is attained.

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